

little doubt that such a society must tend to the spread of knowledge and the improvement of method in pottery manufacture.

AN interesting paper by R. Kremann on the melting point of dissociating substances and the degree of dissociation during melting is contained in the *Sitzungsberichte* (1904, vol. ciii., part vii.) of the Imperial Academy of Sciences of Vienna. From theoretical considerations involving the law of mass action, melting-point curves are deduced for substances, such as the compounds of phenol with aromatic bases and with picric acid, at different degrees of dissociation. By comparing the shape of these curves with those obtained, for instance, on adding aniline to the compound of aniline and phenol, the actual degree of dissociation of these substances during melting may be very approximately ascertained. Incidentally, the important result is established that the addition of one of the products of dissociation of the compound may in many cases cause a rise in the melting point without there being question of the formation of an isomorphous mixture. The results obtained are applied to an investigation of the additive compounds of nitrosodimethylaniline with various aromatic bases.

IN an inaugural dissertation for a doctorate at Bonn University, Herr Jacob Steinhausen presents the results he has obtained during a research on "enhanced lines." Adopting the English name originally proposed by Sir Norman Lockyer, the author gives a detailed description of the enhanced lines and their different appearances in various spectra, and then describes the apparatus and methods employed by him in his own research. Using a small grating of 1 metre radius, which produced a dispersion such that 10 Angström units extended over 0.595 mm. on the plate, he photographed and compared the arc and spark spectra of the elements Al, Sb, Pb, Cd, Mg, Hg, Bi, Sn, Zn, Ba, Ca, Sr, and Ti, using in most cases metallic poles for the spark, and powdered metal, or salt, on carbon poles for the arc. The wave-lengths are only given to the nearest unit, and will, therefore, need re-determining, with a larger dispersion, before they become of any great use for stellar identifications. In discussing the nature of the lines the author adopts an error made by Prof. Kayser (*"Handbuch der Spectroscopie"*), viz. that in accounting for spectral variations Sir Norman Lockyer has always considered only the temperature of the spark as the cause; yet it is now more than thirty years since the discoverer of enhanced lines explicitly stated that the possible effects of electrical variations must be included in the general term "temperature."

SOME ten years ago Prof. H. Moissan, in the course of his work on the production of carbides in the electric furnace, prepared aluminium carbide and showed that in contact with water pure methane was evolved, thus giving a new and direct synthesis of this important hydrocarbon. In the current number of the *Comptes rendus* (February 13) Prof. Moissan and M. Chavanne give an account of their determinations of the physical constants of pure marsh gas prepared in this way. The methane, after being freed from traces of moisture and less volatile impurities by passing through a tube cooled to $-85^{\circ}\text{C}.$, is solidified by cooling with liquid air, and any more volatile gases present pumped away. The gas allowed to boil off from the crystals was proved to be pure by a combustion analysis, and possessed at $0^{\circ}\text{C}.$ and 760 mm. pressure a density of 0.5547, the theoretical density being 0.555. The melting and boiling points were measured by means of an iron-Constantin thermocouple, previously standardised against a petroleum ether thermometer, the crystals melting sharply

at $-184^{\circ}\text{C}.$ and boiling at -164° at atmospheric pressure. The authors add that the methane, purified in this way, always possessed a sweet, faint garlic odour, which cannot be attributed to impurities, and must be regarded as due to the gas itself. The reaction between solid methane and liquid fluorine was studied at the same time; the two substances instantly combined, the reaction being accompanied by a bright flash and a violent explosion, completely pulverising the glass tubes.

A TWELFTH edition of Mr. W. T. Lynn's booklet on "Remarkable Comets" has been published by Messrs. Sampson Low, Marston and Co., Ltd.

THE Cambridge University Press has published the first number of a new scientific periodical entitled the *Journal of Agricultural Science*. The magazine is edited by Messrs. R. H. Biffen, A. D. Hall, T. H. Middleton, and T. B. Wood, in consultation with Messrs. W. Bateson, F.R.S., J. R. Campbell, and W. Somerville. It is intended to circulate among agricultural teachers and experts, and will be issued, as material accumulates, in parts of about one hundred pages. Each volume will consist of four parts. The first number appeals to workers in many departments of agricultural research, and among the articles it contains may be mentioned those on Mendel's laws of inheritance and wheat breeding, by Mr. R. H. Biffen; the influence of pollination on the development of the hop, by Mr. A. Howard; the importance of the removal of the products of growth in the assimilation of nitrogen by the organisms of the root nodules of leguminous plants, by Mr. J. Golding; the analysis of the soil by means of the plant, by Mr. A. D. Hall; variation in the chemical composition of the swede, by Mr. S. H. Collins; soil analysis as a guide to the manurial treatment of poor pastures, by Messrs. T. B. Wood and R. A. Berry; and the improvement of poor pastures, by Prof. T. H. Middleton. The magazine should prove of interest and help to all teachers of agricultural science as well as to those engaged in research in this field of knowledge.

THE third part of Herr C. K. Schneider's *"Illustriertes Handbuch der Laubholzkunde"* has just been published by the firm of Gustav Fischer, Jena. The first two parts were reviewed in NATURE of November 24, 1904 (vol. lxxi., p. 76), and a further notice will appear after the work, consisting of about nine parts, has been completed.

OUR ASTRONOMICAL COLUMN.

EPHEMERIS FOR COMET 1904 e.—The following is an extract from a continued ephemeris for comet 1904 e, as calculated from M. Fayet's elliptical elements by Dr. E. Strömberg, and published in No. 3994 of the *Astronomische Nachrichten* :—

<i>Ephemeris 12h. (M.T. Berlin).</i>												
1905	α (true)			δ (true)		$\log r$	$\log \Delta$	Bright- ness				
	h.	m.	s.	°	'							
Feb. 25 ...	3	10	47	...	+30	7	...	0.1669	...	0.1233	...	0.46
Mar. 1 ..	3	22	3	...	+32	0	...	0.1711	...	0.1359	...	0.43
„ 5 ...	3	33	44	...	+33	47	...	0.1757	...	0.1486	...	0.39
„ 9 ...	3	45	49	...	+35	25	...	0.1805	...	0.1611	...	0.36
„ 13 ...	3	58	16	...	+36	56	...	0.1855	...	0.1736	...	0.33

The comet is now becoming very faint, and is travelling in a north-easterly direction through the southern part of the constellation Perseus. On March 11 it will pass near to ξ Persei.

REVISED ELEMENTS FOR BORRELLY'S COMET (1904 e).—When publishing the previous set of elements for comet 1904 e, M. Fayet explained that, as his computations were based upon the results of only a few observations, they could only be regarded as approximate. Now, however,

the observations extend over nearly a month, and M. Fayet has made another research regarding this comet's orbit, obtaining the following set of elements as his result:—

$$\begin{aligned} T &= 1905 \text{ Jan. } 16 \text{ } 65370 \text{ (M.T. Paris)} \\ \Omega &= 76^\circ 41' 34''.49 \\ i &= 30^\circ 31' 58''.75 \\ \infty &= 352^\circ 13' 58''.98 \end{aligned} \left. \vphantom{\begin{aligned} T \\ \Omega \\ i \\ \infty \end{aligned}} \right\} 1905.0$$

$$\begin{aligned} \log q &= 0.145175 \\ \log e &= 9.792206 \\ \mu &= 503''.932 \end{aligned}$$

These elements give a close agreement with the places determined by independent observations, and indicate that Borrelly's 1904 comet is, really, of the short-period type, completing its orbital revolution in about seven years, instead of six years as given by the previous elements (*Comptes rendus*, No. 5, 1905).

THE SUN'S ROTATION.—During the years 1899, 1900, and 1901 Prof. N. C. Dunér made a further series of observations of the rotation velocity of the sun at different heliocentric latitudes. Combining the results with those obtained by him during a similar research prosecuted in the years 1887–1889, and now corrected, he found the values given in the following table:—

ϕ	v	n	$\xi \cos \phi$	ξ
	km.			
0.4 ...	+2.08 ...	183 ...	14.770 ...	14.77
15.0 ...	+1.97 ...	180 ...	13.989 ...	14.48
30.1 ...	+1.70 ...	184 ...	12.072 ...	13.95
45.0 ...	+1.27 ...	181 ...	9.018 ...	12.75
60.0 ...	+0.81 ...	183 ...	5.752 ...	11.50
75.0 ...	+0.39 ...	184 ...	2.769 ...	10.70

wherein ϕ = the heliocentric latitude, v = the rotational velocity of the sun's edge, n = the number of observations, and ξ = the daily rotation angle (*Astronomische Nachrichten*, No. 3994).

SECONDARY SHADOW ON SATURN'S RINGS.—During a series of observations of Saturn made at Aosta (Italy) in October, November, and December, 1904, Signors M. Amann and Cl. Rozet observed a secondary shadow, other than that of the planet, projected on to the illuminated surface of the rings. First seen on October 20, this shadow was thinner and much less accentuated than that of the planet, whilst its curvature was in the opposite sense to that of the latter body. From October 20 to November 15, despite the fact that numerous opportunities of observing it occurred, the shadow was not seen, but from the latter date until the end of December it was shown on twenty-six drawings of the system. On seven drawings made between December 22 and 27, the shadow appeared bifurcated where it traversed the inner ring, and on November 28 and 29 a third line of shadow, narrower and feebler than the preceding and much further from the planet, was seen (*Comptes rendus*, No. 5, 1905).

OBSERVATIONS OF THE ZODIACAL LIGHT.—During a sojourn on the summit of Mont Blanc on September 21 and 22, 1904, M. A. Hansky made a number of observations of the Zodiacal Light, and found that its form was that of a spherical triangle having its apex near to the ecliptic. At 3h. 40m. (M.T. Paris) the altitude of the apex was 52° , the length of the triangle, reckoned from the centre of the sun, was 80° , and its breadth was, at the horizon, 25° , and in the plane of the sun's axis 30° . The latitude of the apex was $+2^\circ$, and three zones were distinguishable in the light. The first of these had the form of a spherical triangle and was very feeble, the second was more parabolic, whilst the form of the third was a parabola.

In his paper, published in the *Comptes rendus* (No. 6, 1905), M. Hansky indicates the points of resemblance between this phenomenon and the corona, and makes a number of speculations as to the true nature of the light. He concludes by saying that he believes it to be an electrical phenomenon of the same type as the corona, and that it is, probably, simply a prolongation of the core al streamers.

PERMANENT NUMBERS FOR THE MINOR PLANETS DISCOVERED DURING 1904.—In No. 3994 of the *Astronomische Nachrichten*, the permanent numbers allotted to the minor planets discovered during 1904 are given. The list con-

tains the numbers 522 to 548, inclusive, thereby showing the number discovered during last year to be twenty-seven. The provisional designation, the name of the discoverer, the date of discovery, and the authority for the orbit are also given for each planet. A number of notes explain the absence, for various reasons, of several bodies, to which provisional designations were allotted, from the final list.

STUDIES IN EUGENICS.

AT a meeting of the Sociological Society on February 14 Mr. Francis Galton communicated two papers:—(1) restrictions in marriage, and (2) studies in national eugenics.

In the first paper he remarked that marriage, as one of the social agencies that influenced the racial qualities of future generations, came within the purview of eugenics. It belonged to the practical policy arising out of eugenic science, to promote such choice in marriage as should tend to the reproduction of the higher types of individual. Anthropological investigation had shown marriage to be one of the most modifiable of social institutions. Hence the assumption was warrantable that with the gradual incorporation of eugenic conceptions in the social ideal, there would proceed a concomitant change in the customs and conventions affecting marriage. The paper then proceeded to illustrate by actual examples the modifiability of marriage customs. In one or other of its many forms polygamy was now permitted—by religion, customs and law—to at least one-half of the population of the world, though its practice might be restricted, on account of cost, domestic peace, and the insufficiency of females. In Christian nations the prohibition of polygamy, under severe penalties, by civil and ecclesiastical law had been due, not to any natural instinct against the practice, but to consideration of social well-being. Hence it might be inferred that equally strict limitations of freedom of marriage might, under the pressure of worthy motives, be hereafter enacted for eugenic and other purposes. Endogamy, or the custom of marrying exclusively within one's own tribe or caste, had been sanctioned by religion and enforced by law in all parts of the world, but chiefly in long-settled nations, where there was wealth to bequeath and where neighbouring communities professed different creeds. Endogamous systems of marriage rested on customs determined by a certain religious view of family property and family descent. Eugenics dealt with what was more valuable than money or lands, namely, with natural inheritance of high character, capable brains, fine physique and vigour, in short, with all that was most desirable for a family to possess. It aimed at the evolution and preservation of high races, and it well deserved to be strictly enforced. In every society there existed conventional restrictions of the nature of "taboo," though not necessarily called by that name. If non-eugenic unions were prohibited by such taboos, none would take place. Marriage selection was very largely conditioned by motives based on religious and social convention. Persons who were born under the various marriage systems lived under such rules without any objection. They were unconscious of their restriction.

Under the heading "Studies in National Eugenics," Mr. Galton communicated what he described as "an unauthorised programme" of what he conceived to be the duties of the Francis Galton research fellowship in national eugenics. The topics to be considered he classified under the following headings:—(1) Estimation of the average quality of the offspring of married couples from their personal and ancestral data. This included questions of fertility, and the determination of the probable error of the estimate according to the data employed. (2) Effects of action by the State and by public institutions. (3) Other influences that further or restrain particular classes of marriage. (4) Heredity. The facts, after being collected, should be discussed, for improving our knowledge of the laws both of actuarial and of physiological heredity, the recent methods of advanced statistics being of course used. (5) Bibliographical compilations. (6) Extension of eugenic studies by wider cooperation. (7) Certificates. With regard to the last named, he said that in some future time, dependent on circumstances, he looked forward to a suit-